

**US OIL RECOVERY SUPERFUND SITE
WORK PLAN REFINEMENT/MODIFICATION NOTICE**

REFERENCE DOCUMENTS: Remedial Investigation/Feasibility Study (RI/FS) Work Plan, Sampling and Analysis Plan Volume I Field Sampling Plan (FSP), Sampling and Analysis Plan Volume II Quality Assurance Project Plan (QAPP) (all dated December 23, 2015), and USOR WRN-AOI-1-7 (July 9, 2019)

WORKPLAN REFINEMENT/MODIFICATION NOTICE NO.: AOI-1-9

DATE: August 8, 2019

DESCRIPTION OF REFINEMENT/MODIFICATION:

This Work Plan Refinement Notice (WRN) describes the work proposed to fill the data needs identified following collection of Iteration 1 soil and groundwater data, and the review of historical documents related to the Northeast Slope Area at the Site. The historical document review was performed to provide, in part, a better understanding of the potential extent and source of groundwater impacts observed at MW-7 and impacts observed in soil samples collected on the Northeast Slope.

Historical Document Review

Historical documents were reviewed to better understand, in part, Chemical of Potential Concern (COPC) concentrations in soil samples collected on the Northeast Slope, the fill layer present on the Northeast Slope, and the groundwater COPC concentrations observed in groundwater samples collected from MW-7 (Figure 1). Documents reviewed include Bayer 104(e) response documents (Bayer, 2012), United States Corps of Engineers (USACE) documents regarding channel rectification of Vince Bayou during the 1970s, aerial photos, and photos provided by Harris County that documented inspections of the Site in the early 1970s. The data to be collected focus on data needs related to the evaluation of potential response actions in this area of the Site.

Based on the historical documents, the following major events occurred at or adjacent to the Site during the 1970s:

- Early 1971-Late 1971
 - In early 1971, the site was inspected by Harris County; several potential chemical source areas were identified during the inspection (slag waste pile, sludge bed, and a railroad spur unloading area adjacent to the former Rhodia tank farm). Upon review of the historical photos, several surface water drainage channels were identified that potentially allowed arsenic-impacted surface water from the main plant area to drain into the tidal flat area adjacent to Vince Bayou. Stained soils were observed along drainage pathways and in adjacent areas. Figure 1 shows the 1966 aerial with these areas identified.
 - In response to two court orders (March and August 1971), Rhodia reportedly investigated and removed impacted soil and other materials (e.g. slag/waste) from several areas of the property, including the slag waste pile, the former railroad spur and the former sludge bed. Materials removed from impacted areas were reportedly placed in the tidal flat/low-lying areas adjacent to the plant on top of a layer of precipitator dust and below an apparently unimpacted fill layer. Figure 2 shows a 1971 aerial photo with the tidal flat and drainage pathways filled in.
- 1972-1973
 - USACE performed dredging/channel widening activities along Vince Bayou from 1972-1973. According to USACE design memoranda and other historical documents (USACE 1973; USACE 1964), the dredge spoil material was reportedly used to construct a levee adjacent to the bayou. However, the exact dimensions of the levee constructed during the

dredge/channel widening activities are not known, nor are the concentrations of arsenic or other COPCs in the dredged materials.

- Middle 1973 – Late 1973
 - In mid-1973, the site was again inspected by Harris County. Surface water drainage patterns had re-established over the low-lying areas of the plant, potentially allowing arsenic-impacted surface water from the former tank farm to drain to the tidal flat area. The tidal flat area was reportedly accumulating water again due to USACE's construction of a levee along the south bank of Vince Bayou.
 - In response to another court order (July 1973), Rhodia reportedly remediated soils associated with the former Rhodia tank farm. Those soils were reportedly placed in the burial pit area on the southwest portion of the property. In addition, presumed non-impacted soils removed from the burial pits to make room for the impacted soils were placed in the low-lying/tidal flat areas to prevent water accumulating behind the levee constructed by USACE during its dredging activities.

In addition to the historical document review, the Site soil and groundwater data were reviewed. Based on the overall data review, the following data needs were identified:

- Data are needed to enhance the understanding of the potential source and extent of the arsenic exceedances observed in groundwater samples collected from MW-7, as follows:
 - Additional lithological data are needed in the immediate area of MW-7 to evaluate the extent of the thin sand unit encountered at MW-7, and confirmation that the sand unit at MW-7 is not laterally contiguous with the sand unit identified at the Vince Bayou shoreline (MW-16);
 - Lithologic and analytical data are needed to evaluate the historical drainage pathways from the sludge bed that were visible on the 1966 aerial and to better understand the potential transport mechanisms (either current or historical) by which material from the sludge bed may be impacting groundwater;
 - Leachability tests of impacted sludge bed/fill material (e.g. Synthetic Precipitation Leaching Procedure (SPLP) tests) are needed to better understand the potential transport mechanisms from impacted sludge bed materials and impacted fill to soil and groundwater; and
 - Additional groundwater COPC concentration data are needed for better definition of the lateral extent of the arsenic exceedance in groundwater at MW-7 and to understand the potential source of COPC concentrations observed in groundwater samples collected from MW-7.
- Additional soil COPC concentration data are needed to evaluate other historical drainage pathways identified during the review (e.g. north of the current fence line).

To evaluate potential response action approaches, the following work is proposed.

Former Sludge Bed Area:

To address the data needs described above, a focused geoprobe study in that area is proposed, as follows.

One soil boring will be advanced in the approximate center of the former sludge bed as shown on Figure 3. Samples will be collected at the sample intervals specified in the Remedial Investigation/Feasibility Study work plan for source area borings (intervals selected from 0-0.5 feet, 0.5-5 feet and 5 feet-saturation), with observation of the core to evaluate the possible presence of impacted fill material. The samples collected from this boring will be analyzed for the analyte list proposed in WRN-AOI-1-7 (listed on Table 1), which was developed based on the soil and groundwater data collected at the Site during Iteration 1. These include a selected list of metals, pesticides and herbicides, semi-volatile organic

compounds (SVOCs), volatile organic compounds (VOCs) and total petroleum hydrocarbons (TPH). For waste characterization evaluation (i.e. as part of evaluation of potential sludge bed removal option), the sample with the highest COPC concentrations will also be analyzed for TCLP VOCs, SVOCs, pesticides and herbicides and metals. To further define the limits of the sludge bed, at least four soil borings will be advanced at the approximate edges of the sludge bed, as shown on Figure 3. If waste material is observed (either via odor or visual characteristics), step-out borings will be drilled in each direction until the limit of the sludge bed is found. Once those conditions are met, the samples will be collected from one of the final step-out borings in each of the four directions from intervals specified in the Remedial Investigation/Feasibility Study work plan for source area soil borings (intervals selected from 0-0.5 feet, 0.5-5 feet and 5 feet-saturation). Those samples will be analyzed for the analyte list presented on Table 1. Once the focused geoprobe study in this area is completed, the scope of work below may be modified based on field observations or analytical results.

MW-7 Area:

Three temporary monitoring wells will be installed in the vicinity of MW-7 at the locations shown on Figure 3 to allow for collection of additional groundwater samples. Soils from the borings will be lithologically logged to evaluate the presence of fill material and the thin sand unit encountered at MW-7. Soil samples will be analyzed for the analyte list presented in Table 1. The monitoring wells will be constructed with a pre-pack well screen and will be developed using surging or pumping. At least 24 hours after well development, a groundwater sample will be collected from each well and analyzed for the analyte list presented in Table 1. Once the wells have been sampled, the wells will be plugged.

Two soil borings will be advanced within historical drainage pathways in the immediate vicinity of the former sludge bed, as shown on Figure 3, with samples collected from the sample intervals specified in the Remedial Investigation/Feasibility Study work plan for source area borings (intervals selected from 0-0.5 feet, 0.5-5 feet and 5 feet-saturation). The borings will be located via GPS based on the approximate locations shown in historical aerial photographs. Visual observations of the cores will be conducted to evaluate the possible presence of fill material and the thin sand unit encountered at MW-7. The soil samples from these borings will be analyzed for the analyte list provided in Table 1.

Four fill material/soil samples, which will be selected from samples collected from the soil boring or temporary monitoring well borings of varying arsenic concentrations, will be selected for SPLP analysis for arsenic to evaluate arsenic leachability in the impacted materials.

Other Historic Drainage Pathway Evaluation

To investigate other historical drainages, five borings will be completed within historic drainage footprints (via GPS based on previous aerial photographs), as shown on Figure 3. Soil samples will be collected from the sample intervals specified in the Remedial Investigation/Feasibility Study work plan for source area borings (intervals selected from 0-0.5 feet, 0.5-5 feet and 5 feet-saturation). The soil samples from these borings will be analyzed for the analyte list provided in Table 1.

RATIONALE FOR REFINEMENT/MODIFICATION:

Additional data collection activities are proposed to fill data needs, as identified during a historical document review and a review of existing RI data. The work proposed in this WRN includes soil sampling, groundwater sampling and leachability testing. These data will be used to support the evaluation of potential response actions.

References

Bayer Corporation (Bayer), 2012. Letter RE: US Oil Recovery Superfund Site, Pasadena, Harris County, Texas, CERCLA 104(e) Information Request Received on June 1, 2012. July 16.

U.S. Army Corps of Engineers (USACE), 1973. 1973 Annual Report of the Chief of Engineers on Civil Works Activities. Volume II, Galveston District.

U.S. Army Corps of Engineers (USACE), 1964. Vince and Little Vince Bayous, Texas, Channel Rectification, General Design Memorandum and Feature Design Memorandum for Vince Bayou - Mouth to Mile 3.9. U.S. Army Engineer District, Galveston. November.

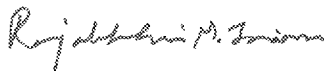
Respondents' Project Coordinator:



Date: 8/8/2019

Eric Pastor
Golder Associates, Inc.

EPA Project Manager:



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JOSIAM

Date: 2019.08.09 08:30:32 -05'00'

Raji Josiam

TABLE

Table 1
Proposed Analyte List
WRN AOI-1-9
US Oil Recovery Superfund Site
Pasadena, TX

CHEMICAL OF POTENTIAL CONCERN (COPC)				
CHEMICAL GROUP				
METALS	PESTICIDES AND HERBICIDES	SEMI-VOLATILE ORGANIC COMPOUNDS	VOLATILE ORGANIC COMPOUNDS	PETROLEUM HYDROCARBONS
Antimony	2,4-D	1,4-Dioxane	1,4-Dichlorobenzene	C6-C12
Arsenic	2,4-DB	1-Methylnaphthalene	Benzene	>C12-C28
Barium	4,4'-DDD	2-Methylnaphthalene	Chlorobenzene	>C28-C35
Boron	4,4'-DDE	Acenaphthene		TPH
Chromium	4,4'-DDT	Acenaphthylene		
Cobalt	Aldrin	Anthracene		
Manganese	alpha-BHC	Benz(a)anthracene		
Mercury	alpha-Chlordane	Benzo(a)pyrene		
Selenium	beta-BHC	Benzo(b)fluoranthene		
Thallium	Dalapon	Benzo(g,h,i)perylene		
	delta-BHC	Benzo(k)fluoranthene		
	Dichlorprop	Bis(2-ethylhexyl)phthalate		
	Dieldrin	Butyl benzyl phthalate		
	Dinoseb	Carbazole		
	Endosulfan I	Chrysene		
	Endosulfan II	Dibenz(a,h)anthracene		
	Endosulfan sulfate	Fluoranthene		
	Endrin	Fluorene		
	Endrin aldehyde	Indeno(1,2,3-cd)pyrene		
	Endrin ketone	Naphthalene		
	gamma-BHC	Phenanthrene		
	gamma-Chlordane	Pyrene		
	Heptachlor			
	Heptachlor epoxide			
	MCPA			
	MCPP			
	Toxaphene			

Note: This analyte list is the same analyte list presented in the US Oil Recovery Superfund Site WRN-AOI-1-7.

FIGURES

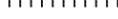
	CPT LOCATION
	CPT/ROST LOCATION
	CPT LOCATION - ELIMINATED DUE TO UNDERGROUND OBSTRUCTION
	MONITORING WELL NOT INSTALLED DUE TO PRESENCE OF SATURATED FILL MATERIAL
	VINCE BAYOU SEDIMENT/SURFACE WATER SAMPLE LOCATION
	VINCE BAYOU SEDIMENT SAMPLING LOCATION
	FORMER RAILROAD SPUR
	FORMER RAILROAD SPUR (APPROXIMATE EXTENT OF RAILROAD SPUR REMOVED DURING REMEDIATION ACTIVITIES IN THE 1970s)

FIGURE
1

===== APPROX. PROPERTY BOUNDARY


CONSULTANT	YYYY-MM-DD	2019-06-12
 GOLDER	DESIGNED	AJD
	PREPARED	AJD
	REVIEWED	RJR
	APPROVED	MKW

FIGURE
2

	CPT LOCATION
	CPT/ROST LOCATION
	CPT LOCATION - ELIMINATED DUE TO UNDERGROUND OBSTRUCTION
	MONITORING WELL NOT INSTALLED DUE TO PRESENCE OF SATURATED FILL MATERIAL
	VINCE BAYOU SEDIMENT/SURFACE WATER SAMPLE LOCATION
	VINCE BAYOU SEDIMENT SAMPLING LOCATION
	PROPOSED SOIL BORING LOCATION
	PROPOSED SOIL BORING/TEMPORARY MONITORING WELL LOCATION
	FORMER RAILROAD SPUR
	FORMER RAILROAD SPUR (APPROXIMATE EXTENT OF RAILROAD SPUR REMOVED DURING REMEDIATION ACTIVITIES IN THE 1970s)

FIGURE
3